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ABSTRACT

The issue of developing a new framework of industry programs for vocational education in the United States was examined in a study of the current status of programmatic structures nationally and among the 50 states. The following are among the topics that were explored: (1) the rationale for a new programmatic framework in the context of changing economic and technological conditions; (2) emerging strategies for improving secondary and postsecondary education; and (3) alternative approaches to defining industry, career, and occupational clusters (taxonomies in use in Sweden and New Zealand; curricular divisions and taxonomies developed by the American Vocational Association and the National Skill Standards Board; frameworks in use in Oregon and Maryland). At least seven major industry clusters common to national and state initiatives were identified. It was recommended that the clusters be incorporated into a flexible framework for communicating the overall mission and scope of career and technical education in the United States and providing guidance for curriculum development and improvement. The study concluded that whatever framework finally emerges, it should address students' long-term employment prospects, encourage high levels of academic proficiency and mastery of sophisticated work-based knowledge and skill, and preserve the full range of postsecondary options for program participants. (MN)

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TOWARD A NEW FRAMEWORK

OF INDUSTRY PROGRAMS FOR

VOCATIONAL EDUCATION

Emerging Trends in

Curriculum and Instruction

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TOWARD A NEW FRAMEWORK OF INDUSTRY PROGRAMS FOR VOCATIONAL EDUCATION

Emerging Trends in Curriculum and Instruction

Vocational education in the United States is undergoing some important changes. Throughout most of this century, vocational education programs have focused primarily on narrow preparation for occupations requiring less than a baccalaureate degree, and have traditionally concentrated on readying youth and adults for entry-level jobs in agriculture, business, marketing, health, occupational home economics, trade and industry, and a limited number of technical areas. Today, a variety of efforts at the local, state, and national levels are aiming to broaden vocational education-integrating the curriculum more closely with rigorous academics, improving articulation to postsecondary education (four-year as well as two-year), and stressing long-term preparation for productive careers that will be subject to increasing technological change and economic reorganization.

To facilitate this transition, a new programmatic framework is needed that recognizes the broader focus of vocational education and that encompasses the full range of career opportunities available in the economy of the 21st century. Precisely what form this framework should take is not yet clear. National organizations concerned with vocational education and employment training presently use a variety of different approaches. The National Skill Standards Board, for example, has proposed a structure based on 15 large economic sectors, which together account for virtually all paid employment in the United States. The National Board for Professional Teaching Standards, which develops national credentials for academic and vocational teachers, has suggested eight categories of vocational specialization.' The American Vocational Association uses divisions that, for the most part, conform to the traditional program structure that has characterized vocational programs for the past 50 to 70 years. Vocational student organizations also reflect this older structure.

To better understand how these changes in vocational education might affect curriculum and instruction, the Office of Vocational and Adult Education (OVAE) commissioned

'National Boar-d for Professional Teaching Standards, *Vocational Education Draft Standards for National Board Certification,* Southfield, MI: National Board for Professional Teaching Standards, May 1996.

MPR Associates to produce a paper examining the current status of programmatic structures, nationally and among the 50 states. To achieve this objective, the paper

- assesses the rationale for a new programmatic framework and its relationship to changing economic and technological conditions, as well as emerging strategies for improving secondary and postsecondary education; and

- reviews alternative approaches to defining industry, career, and occupational clusters now in use or under consideration by relevant organizations and agencies.

Why a New Programmatic Framework?

Although most Americans agree that a major objective of education is preparing students for successful participation in the world of work, most are also somewhat uneasy about this aim. Certainly the mission of education has other important ends-for example, instilling a thorough understanding of the nation's heritage and common culture and developing strong citizenship-that could be displaced by a single-minded focus on economic concerns. Additionally, economic considerations can be defined too narrowly, focused only on the very short term or on specialized interests of particular corporations or business sectors. Schools can also serve merely to reproduce existing inequities in the work world by underestimating the abilities of particular students or prematurely tracking certain students into low-level programs of study. Hence, how education is structured to prepare students for work is a critical and often controversial topic in education policy discussions.

Vocational education is one part of the education system formally charged with some aspects of work force preparation. While vocational education was once offered primarily in high schools and intended to provide occupationally specific training for students who would enter the labor force immediately after high school, during the past 20 to 30 years it has assumed an increasingly larger role in community colleges and proprietary schools. These postsecondary institutions typically offer programs that are more advanced and more technical than those offered in high schools; however, the programs are still focused mainly on preparation for work that requires less than a baccalaureate degree. Consequently, while the focus and the curriculum content of vocational education have expanded significantly beyond grade 12 to include the first two years of postsecondary education, vocational education has remained largely job specific, targeted on entry-level opportunities, and relatively isolated from the academic curriculum that constitutes the bulk of secondary and postsecondary instruction[2].

This arrangement has had certain advantages. As long as employment opportunities in the sub-baccalaureate job market remained stable and produced reasonably high paychecks, occupationally specific vocational education made sense, especially for students who had difficulty succeeding in the traditional academic curriculum. Moreover, the vast majority of jobs in the economy did not require a baccalaureate degree. Therefore, the opportunity costs of pursuing a four-year degree were substantial when well-paying alternatives were readily available.

As we enter the 21st century, the traditional structure for delivering vocational education is less tenable. Sub-baccalaureate jobs that once were plentiful, long lasting, and high paying are disappearing with increasing rapidity. The number of stable jobs in manufacturing, automotive, primary metals, and consumer appliances has decreased considerably under the onslaught of automation. Further, technology has decimated job opportunities for telephone operators, food production workers, and even secretaries and clerical personnel. More and more jobs, especially those paying a living wage, require postsecondary education, and while a four-year degree is not likely to be required of the majority of workers any time soon, some postsecondary learning is increasingly desirable[3].

To be sure, the education system must still prepare people for entry-level employment. By definition, everyone's labor market experience begins at the entry level, and there is critical knowledge and skill one must possess to succeed even at this initial step. However, it is

This definition-while serving to target federal funds on high schools and community colleges and on populations less likely to fare as well in the labor force-has also had the unfortunate effect of contributing to the widespread public perception that vocational education,

[2] *Under federal law, vocational education has been defined as preparation for occupations that require less than a baccalaureate degree, and more generally any form of education for work, is not appropriate for students aspiring to attend four-year college or university. The newly reauthorized Vocational Education Act maintains this definition, stipulating that vocational education is made up of organized educational activities that "offer a sequence of courses that provides individuals with the academic and technical knowledge and skills the individuals need to prepare for further education and for careers (other than careers requiring a baccalaureate, master's, or doctoral degree) in current or emerging employment sectors." Proposed 1998 Vocational Education Act, Title I, Sec. 3 (29)(A).*

[3] *The assertion that the majority of jobs do not require a baccalaureate degree, while true, is a very misleading statement, especially when it is used to suggest that four-year college is not a particularly essential goal for many young people. In the first place, this statistic is cross-sectional measure made at one point in time. At any given time, a significant number of jobs are held by people ages 16-21 who cannot yet have completed a four-year degree even if they are pursuing that goal. However, assuming it is desirable for adults to have access to increasingly higher paying jobs as they age, it becomes less and less likely that sub-baccalaureate jobs will support a rising standard of living. Essentially, a cross-sectional measure is being used to represent a longitudinal phenomenon. Finally, it is also disturbing that virtually all of the people asserting that baccalaureate degrees are not essential for successful, long-term labor market participation already have one.*

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no longer sufficient to rely on a system of vocational education that concentrates mainly on entry-level participation in a particular occupation. Rather, successful and lasting participation will increasingly depend on adapting to shifting employment opportunities and on building knowledge and skill to keep pace with technological change and the shifting trends of a global economy.

A new framework for delivering effective professional and technical education, therefore, must have several essential features. First, the overarching structure must conceive of work broadly and for the long term. This does not mean that occupationally specific education should be abandoned. On the contrary, much teaching and learning must remain specific and concrete. However, mastering the specific and concrete needs to take place in a larger context-one that will encourage students to generalize their learning and make connections to problems and ideas they are likely to encounter as the specific nature of their immediate job changes or as they, by choice or not, pursue employment opportunities in other industries.

Second, the framework should help strengthen the academic foundation of secondary and postsecondary education by helping students learn and apply a wide range of academics in a work-related context. As a rule, it will be easier to emphasize a rigorous, coherent program of academic study when industries and occupations are defined broadly. For example, it is much easier to systematically apply key aspects of the high school science curriculum when the context is the entire health industry rather than a very specific health occupation, such as dental assisting or inhalation therapy.

Third, the framework should enable, or at least not discourage, strong connections between the high school curriculum and the full range of postsecondary offerings, including those at four-year institutions. Again, broader conceptions of industry or occupation are more likely to accomplish this objective than narrow ones. A program developed around the building trades, for example, implies through its very design that participants are not likely to pursue four-year college. In contrast, a program defined more broadly around building and environmental design-with an emphasis on planning, architecture, engineering, and interior design in addition to carpentry, masonry, and electricity-does not inherently preclude four-year postsecondary options. Not everyone participating in this more broadly defined program will, in fact, attend a four-year college. However, there is no *presumption* that because they participate in the program, they will not go to a four-year college or university.

Fourth, the framework should be defined so as to emphasize long-term career development, not just preparation for an entry-level occupation. The academic requirements of most entry-level positions are usually quite low, rarely requiring more than eighth-grade levels of proficiency. By adopting a programmatic framework that takes a longer-range view, there are greater opportunities for using work-centered, contextualized education to advance students' learning of high-level academic knowledge and skills.

Finally, the framework should aim to ensure that work force preparation in secondary and postsecondary education addresses the long-term requirements of successful economic and social development without unwittingly serving narrow, short-term interests of specialized industries, sectors, occupations, or corporations. On both the left and the right of the political spectrum, critics of vocational education and more recently of school-to-work have raised legitimate concerns that poorly conceived programs may do little more than reduce labor costs, relieve temporary labor shortages, perpetuate work force inequities, or otherwise produce outcomes that have little direct benefits for program participants.

Much of the vocational education enterprise is already moving toward this broader and longer-range framework. As will be noted below, many states have recently adopted systems of industry or career clusters and are currently changing vocational programs and curriculum. However, most of these efforts are still very preliminary. A national framework that encourages and supports these emerging trends would help strengthen vocational education's contribution to work force development in the next century.

Industry Versus Occupation as an Organizing Framework

In considering alternative new programmatic structures for vocational education, it is important to distinguish between two related but different organizing concepts: industry and occupation. An industry consists of a wide range of organizational arrangements and operations that combine land, labor, and capital to produce products or services-say, automobiles, steel, health services, or housing. An occupation typically defines the performance of a particular labor function-accounting, plumbing, dental assisting, performing surgery, lawyering, or piloting an aircraft-that contributes to production. An occupation may be heavily concentrated in a particular industry (engineering in manufacturing, for example), or it may be found in virtually all industries (say, financial management or secretarial services).

It is worth noting that both industry and occupation can be defined broadly or narrowly, although industry will usually allow a greater degree of generality. At a very broad level, for example, the transportation industry in all of its forms (air, sea, and ground) provides a coherent framework for examining how we move people and goods in the modem economy. Much more narrowly, the commuter airlines or interstate trucking are recognizable industries in their own right. Adopting transportation rather than some more narrow categorization as a contextual framework has several desirable properties. For one thing, it helps integrate a wide range of academic knowledge and skill. Additionally, it has a certain timeless quality that can accommodate both historical and future treatment of a broad spectrum of subject matter. It is considerably easier, for example, to build major aspects of a history curriculum around the theme of transportation than one limited to interstate trucking.

Similarly, we can define occupations broadly (engineering, for example) or more narrowly-say, aeronautical, automotive, civil, electrical, industrial, or petroleum engineering. Here also, the broader the occupational focus, the easier it is to link work-based curriculum to academics and provide students with more breadth and depth across the academic curriculum. It is also easier to ensure that students master a sufficiently broad foundation of occupational knowledge and skill that will allow them to make connections across specialties, as well as work more effectively with others engaged in related occupations. The importance of occupational breadth to curriculum content is readily apparent at the postsecondary baccalaureate and graduate level, where work-centered education is organized around large professions. One does not go to surgery school or criminal law school, for example. Rather, broader preparation in medicine and law is the organizing focus, with specialties encouraged within this larger framework. Similar patterns may be found in schools of architecture, business, and engineering.

The decision to focus on either industry or occupation has important implications for curriculum. A broad industry-based curriculum is more likely to stress such aspects as the historical evolution of major social and economic functions (transportation, communications, health, education, or agriculture); significant technological developments within the industry; economics (both the internal functioning of the industry, as well as its place in the larger economy); systems of production and distribution; the organization and functions of human resources; the industry's interaction with government and the public sector; environmental concerns; and various aspects of health and safety.

A broad occupational focus, in contrast, is more likely to emphasize the culture and norms of an occupation or profession; knowledge and skill essential to practicing in the profession; the understanding and use of particular tools

(whether cognitive or physical); and familiarization with the kinds of tasks one is expected to perform and the kinds of problems one is likely to encounter on the job.

Neither focus, industry or occupation, is inherently superior, nor are they mutually exclusive. Thus, the typical business school curriculum addresses economics and a variety of issues germane throughout industry, while also preparing students for careers in accounting, financial management, human resources, or management consulting. Conversely, an engineering school may focus on preparing aeronautical engineers while still ensuring that students gain a more general understanding of the aviation industry or transportation in general.

In some respects, the choice of either an industry or an occupational focus is an issue of emphasis, and this choice is, in turn, a question of primary purpose. Thus, if the aim is using the world of work to help students master a strong foundation of generic knowledge and skill, academic as well as work related, an industry focus is probably more effective because it will permit easier integration with the full range of academic disciplines. In other words, in an industry-based model, the primary objective is encouraging high levels of proficiency in mathematics, science, English, and social studies using an industry domain (health, transportation, agriculture, or some other major industry) that holds interest for students and allows them to better understand why they need academic knowledge and how to use it. Students may or may not wind up working in the particular industry that provides the context for their academic work, and whether or not they do is really immaterial, as long as they have mastered the academic foundation that will serve them well regardless of what industry or occupation they later choose to pursue.

However, if the primary objective is preparation for employment, especially in the near term, an occupationally based model may make more sense. Here the aim is arming students with the knowledge and skill needed to embark on a particular career with rather well-defined points of entry and pathways for future growth. Even in this model, there is still need for a solid academic foundation, but the curriculum is more likely to define the work-related context more specifically and emphasize practice and on-the-job performance. Moreover, the application of academics will probably occur more often in courses designed specifically for the occupation or profession than in the academic curriculum. Here again, the practice in most professional schools is illustrative. Learning business applications of quantitative methods will probably be part of the business school curriculum, not a focus of courses offered in departments of mathematics or statistics. In short, an occupational focus,

especially the more specialized it becomes, will require that most opportunities for applied academics occur in the vocational rather than the academic curriculum.

Historically, vocational education has adopted mainly an occupational outlook. Its programs have prepared students for occupations-bookkeeper, electrician, inhalation therapist, dietitian, machinist, electronic repair technician, automotive technician, and so forth. With the exception of many agriculture programs, the vocational curriculum has provided relatively little industry perspective for its students.[4] Students concentrating in carpentry or one of the other building trades, for example, are not likely to learn much about the role the construction industry plays in the national economy, the evolution of building materials and other technological developments, the deployment of people and their respective roles and responsibilities throughout the industry, or the role that government and regulation assume in everything from finance to health, safety, and land use planning. Nor are they likely to be exposed to very high levels of mathematics, science, and other academic subjects.

To reiterate, if the primary objective is preparing students to be traditional carpenters, there is nothing wrong with this approach. On the contrary, it is quite efficient and effective, and throughout the nation's schools, there are fine carpentry programs that train first-rate, entry-level carpenters. Many of these program completers may go on to become journeymen and skilled craftspersons, perhaps through formal apprenticeship programs or less formal means of on-the-job training.

However, if the objective is broader, the conventional occupational structure of vocational education makes less sense. If, for example, the aim is expanded to promote even a limited amount of occupational cross-training-such as becoming familiar with other aspects of construction such as masonry, electricity, plumbing, and heating and cooling-the single occupational focus of a vocational program no longer works. A more inclusive program in construction technology may be a better alternative. Moreover, if the objective is further expanded to provide the construction student with the basic knowledge and skill needed to develop and operate a construction-related business or to pursue postsecondary education in engineering, architecture, technical drafting, or interior design, the narrow occupational focus is even less fitting. Rather a more comprehensive organization around building and environmental design will be more effective.

[4] *Agriculture is a notable exception. Throughout this century, vocational agriculture programs have typically adopted a very broad perspective with a curriculum that not only emphasizes the full range of occupational opportunities in agriculture but also plays a major role in teaching about rural culture and the role of agriculture in society.*

In the final analysis, therefore, choices about the programmatic framework for vocational education are choices about the basic purpose of vocational instruction and its respective role in the larger mission of secondary and postsecondary education. Getting clear about these aims and their implications for curriculum, instructional methods, and the overall organization of high schools and postsecondary institutions is not easy. There are multiple and sometimes conflicting objectives. Of course, we want young people to enjoy lasting and increasingly more rewarding success in the work world, and that aim argues for high levels of proficiency across the curriculum and in-depth understanding that will allow them to continue to learn and adapt to the rapidly changing nature of work. But we also want them to experience short-term success, to have the specific qualifications needed to land existing jobs, and to support themselves whether or not they elect to pursue further education. In many instances, generic knowledge and a sophisticated understanding of an industry and its operations will not be sufficient to perform in these occupations. We cannot, therefore, abandon occupationally specific preparation.

One strategy, consequently, is to relocate occupational preparation in a broader framework of industry-based education, being clear that, while related, the two are not the same thing. Such a shift will present the greatest challenges for high schools, where the separation between academic and vocational education has been the most extreme and where the image of work-related education has been limited to occupations requiring less than a baccalaureate degree. At the postsecondary level, especially among four-year institutions and graduate-level professional schools, there is a stronger tradition of infusing preparation for work with academics and maintaining better relations between academic departments and schools of business, nursing, dentistry, medicine, architecture, law, education, public policy, engineering, and social work.

Although the connections between education and work have also been debated at the postsecondary level, generally there is widespread agreement that preparation for the work world is an appropriate part of the mission of higher education. Indeed, the way most four year colleges and universities approach integrating education and work could provide the basis for new models of vocational education in secondary schools, as well as in many community colleges. Linking education and work in colleges and universities succeeds for many reasons. Two are especially important. First, the postsecondary departments engaged in preparing students for work adopt a broad, long-term view. To be sure, they want their students to obtain specific jobs, but their first responsibility is to strengthen and sustain a profession or industry and assure that their students develop a thorough understanding of the professional world they will join. Second, these departments embrace and celebrate academic knowledge and skill, applied to their own

particular professional interests and problems. Faculty in these departments have high regard for the academic disciplines, encourage or even require their students to take a coherent program of related academic courses, and expect their students to demonstrate high levels of academic achievement. Modeling a new framework of vocational education for secondary education on these two tenets could have enormous benefits for high school students who have rarely had the option of choosing a program of study that is both academically rigorous and firmly grounded in practical but challenging application.

The remainder of this paper examines some alternative programmatic formulations. In considering the possibilities, it is important to keep in mind that there is no one right way to structure future vocational education offerings. Some approaches, however, are better than others, and a few may not be suitable at all. Determining which is which should be guided by how well a particular formulation promotes the long-term employment prospects of program participants, preserves the full range of postsecondary options, and encourages high levels of academic proficiency and mastery of sophisticated work-based knowledge and skill.

Alternative Organizing Frameworks

To explore different ways of organizing the delivery of vocational education in the United States, illustrative examples of various approaches to structuring industry majors and career clusters are available from at least three sources: other countries, recent national initiatives in the United States, and various state efforts. This section presents and briefly analyzes some structures from each of these.

International Examples

Several other countries have restructured their overall framework for organizing the way schools prepare students for successful participation in the world of work. One of the first to do so was Sweden, which in the 1980s undertook a comprehensive assessment of its approach to vocational education, especially in secondary schools. Before restructuring, Sweden's system of delivering occupational instruction was similar to that used in other Scandinavian countries and most of Europe. It emphasized occupationally specific training, using faculty and curriculum largely independent of the rest of the education system. Through its new framework, Sweden sought to better integrate work force preparation with

academic instruction and raise the academic proficiency of students who were less likely to attend university after high school.

Table 1 displays Sweden's new instructional taxonomy. The structure organizes instruction in high schools into 15 subject areas, and students are expected to major in one of these. Most of these subject areas represent large industries, but there are some exceptions: natural sciences and social sciences constitute two of the subject areas. Clearly, these are not "industries," and their inclusion in the taxonomy reflects the philosophical and political struggles that surrounded the reorganization. The academic community strongly resisted complete integration of traditional disciplines into the industry framework and insisted on "academic" alternatives, especially for students bound for universities.

There are some other unusual aspects of the Swedish taxonomy. It is not clear, for example, why child care should be included with the leisure, hotel, and restaurant industries. Moreover, education, as well as government and public administration, are missing from the framework, curious omissions for a country that depends so heavily on the public sector. Finally, the recognition of handicrafts as a separate industry may strike some as atypical, although handicrafts do figure more prominently in the Swedish economy than in other industrialized nations.

Table 1
Sweden's Industry Taxonomy

Aesthetic	
Child Care, Leisure, Hotel, & Restaurant	Industry
Construction	Land & Animal Husbandry
Electricity	Media
Energy	Natural Sciences
Foodstuffs	Social Sciences
Handicrafts	Trade & Administration
Health Care	Transport Technology

New Zealand has taken a somewhat different approach. Rather than begin restructuring by reorganizing curriculum and educational delivery, New Zealand decided to first develop a system of national standards for certification in 16 major fields. The New Zealand National Qualifications Framework (Table 2), which consists of eight levels of progress

sion within each field, provides an overarching framework of career pathways within the country's major industries to guide curriculum and instruction. Students accumulate credits toward qualification at a particular level in each field. The first three levels of progression set standards for qualification in secondary education; levels four through six are standards reflecting advanced trade, technical, and business qualifications; and levels seven and eight equate to advanced qualifications at the graduate and postgraduate levels. Certificates are awarded for proficiency at levels one through five, and diplomas are granted for levels six and above.

Table 2

New Zealand National Qualifications Framework

Agriculture, Forestry, & Fisheries	Humanities
Arts & Crafts	Law & Society
Business & Financial Services	Manufacturing
Community & Social Services	Maori
Computing & Information Technology	Planning & Construction
Education	Sciences
Engineering & Technology	Service Sector
Health	Social Sciences

As a learner earns credits, the educational institution notifies the New Zealand Qualifications Authority, which maintains a national database on the credits and qualifications of all participating students. Once a year, or more often if requested, the participant receives a record of all standards and qualifications achieved to date. This is called the "Record of Learning" and is an official document, used as a credential for employers and educational providers.

Although the New Zealand framework is more inclusive than the Swedish taxonomy-education and public services are explicitly recognized-the framework also maintains separate academic qualifications in the humanities, sciences, and social sciences. Additionally, education and training providers have considerable freedom to develop their own programs. Consequently, the curriculum and program structure of individual institutions does not necessarily conform precisely to the national framework. Providers must be accredited, but the New Zealand Qualifications Authority accredits institutions, not programs of study, based on qualifications of faculty, assessment expertise, and the quality of institutional management.

Accredited institutions perform assessment, but the New Zealand Industry Training Organization also certifies individual registered assessors. Hence, an applicant for a particular level of qualification does not need to be enrolled in school. In determining qualifications, assessors may use a wide range of evidence, including evidence from a candidate's workplace in addition to traditional tests.

National Examples in the United States

As noted previously, vocational education in the United States has historically been organized under seven major program areas: agriculture, business, home economics (now called "fan-Lily and consumer sciences"), health, marketing, technical, and trade and industrial. These seven areas, along with technology education, constitute the eight curricular program divisions of the American Vocational Association (Table 3) [5].

Table 3

Curricular Program Divisions of the American Vocational Association*

Agricultural Education, Business Education
Family & Consumer Sciences Education
Health Occupations Education
Marketing Education
Technical Education
Trade & Industrial Education
Technology Education

*Excluding Administration, Employment and Training, Guidance, Special Needs, and New and Related Services.

[5]The American Vocational Association has a total of 13 divisions; however, the other five do not represent areas of curriculum and instruction.

Not surprisingly, this organizational structure reflects the historical evolution of vocational education in the United States, and this is both its strength and its weakness. On the one hand, each division can lay claim to a strong tradition and substantial experience with curriculum and instruction organized around its particular program area. Within each division, there is a strong professional identity that fosters communication and collegiality. On the other hand, because the structure is so firmly rooted in more than 70 years of history, it also reflects some of the awkward compromises that change imposes on established organizations. Thus, it is not apparent that maintaining a separate division for technical[6]. Education is appropriate when all sectors of the economy are becoming more and more technical. The trade and industrial nomenclature is to some extent an artifact of the first half of the 20th century and does not communicate very clearly the rapid shift toward advanced manufacturing and the knowledge-based industries of today. Additionally, major sectors of the economy are not explicitly acknowledged as falling within the domain of vocational education-for example, education, government, communications, transportation, and hospitality. As a result, the potential significance of vocational education in work force preparation may be diminished.

Nevertheless, there are some thorny problems associated with any major alteration of this structure. Probably one of the most difficult is the appropriate treatment of family and consumer sciences education. At the federal level, home economics has been part of the vocational education enterprise since passage of the Smith-Hughes Act in 1917, although it has always received funding under the separate title of federal legislation. As a result of this long-standing federal arrangement, home economics has also been part of vocational education administration in most states.

Including home economics or its contemporary counterpart, family and consumer science education, within the vocational education domain has some justification. Historically, this program has had as one of its objectives preparing young people for unpaid employment in the home. Additionally, many states have offered programs in occupational home economics-which prepare students for paid positions in such occupations as nutritionist, seamstress, or child care worker. Consequently, there are direct links to work force preparation that may warrant continuing to include this program under the

[6] *Maintaining a technical education division and a technology education division is also confusing to most people who are unfamiliar with the history of how these two divisions emerged.*

vocational education umbrella. Certainly, the occupational programs belong there, although it is not clear that any kind of "home economics" label is the best way to characterize them[7]

However, whether programs whose primary purpose is improving parenting or consumerism properly belong in vocational education is debatable. These are, to be sure, important aspects of elementary and secondary education that deserve a prominent place in the curriculum. However, aside from historical practice, it is difficult to see why these programs should be part of the vocational education enterprise, any more than physical education, nonoccupational health programs, or the arts.

Nevertheless, history and tradition are not easy to change, and sometimes it is simply better to make do with the status quo, even if it does not reflect the most elegant and coherent organizational framework. Perhaps such pragmatism was partly behind the recommendations of the National Board for Professional Teaching Standards, which has suggested eight fields for certification of vocational education teachers (Table 4). Thus, it retained family and consumer services and technology education in its proposed framework. However, it did make notable changes in other areas, creating new fields of human services and arts and communication and modifying three others. In the Board's formulation, agriculture becomes agriculture and environmental sciences; business becomes business, marketing, and information management; and trade and industrial becomes manufacturing and engineering technology. The end result is a more contemporary and inclusive formulation for vocational education. The Board's proposal, however, is still in draft form. What will finally emerge remains to be seen.

At the national level, by far the most comprehensive taxonomy for organizing work force preparation and setting standards to guide it comes from the National Skill Standards Board (NSSB). NSSB has adopted a framework of 15 industry clusters to direct its work on developing skill standards for curriculum, certification, and employment (Table 5). Together, these 15 clusters represent all paid employment in the American economy (with the exception of some areas such as crime).

[7] The "occupational home economics" label is an artifact of pressures in the late 1960s and early 1970s to distinguish preparation for paid employment in this field from other types of consumer and homemaking programs, especially those offered in middle schools. Few, if any, states continue to use this nomenclature, and assigning programs for such occupations as nutritionist, child care worker, and seamstress and other programs included in the occupational home economics category to their respective industry classification would be an easy matter.

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Table 4

National Board for Professional Teaching Standards

Field of Vocational Education Certification

Agriculture & Environmental Sciences

Arts & Communication

Business, Marketing, & Information Management

Family & Consumer Services

Health Services

Human Services

Manufacturing & Engineering Technology

Technology Education

Table 5
National Skill Standards Board Industry Clusters

Agriculture, Forestry, & Fishing

Business & Administrative Services

Construction Operations

Education & Training

Finance & Insurance

Health & Human Services

Restaurants, Lodging, Hospitality & Tourism, & Amusement & Recreation

Manufacturing, Installation, & Repair

Mining & Extraction

Public Administration, Legal, & Protective Services

Transportation

Scientific & Technical Services

Telecommunications, Computers, Arts & Entertainment, & Information

Utilities & Environmental & Waste Management

Wholesale /Retail Trade, Real Estate, & Personal Services

With respect to employment, these sectors vary substantially, ranging from only 0.45 percent of total employment in mining and extraction to almost 20 percent in wholesale and retail trade, real estate, and personal services (Table 6). These figures on employment should be used cautiously because they are very much influenced by how one defines the scope of a particular industry and how various sub-industries are assigned. To some extent, these decisions are arbitrary. For example, the NSSB framework defines agriculture as consisting of crop and animal production; veterinary services; forestry and logging; landscaping; and fishing, hunting, and trapping. These industries account for about 3 percent of total employment. It is, of course, possible to conceive of agriculture quite differently-including, for example, food processing and packaging (which NSSB assigns to manufacturing) as well as retail distribution (which NSSB assigns to wholesale and retail trade). Moreover, this more comprehensive view of agriculture might yield more interesting curriculum possibilities than that adopted by NSSB.

Although some of these decisions about definitions are merely judgment calls with no clear rationale, there are some debatable features of the NSSB taxonomy. It is not clear, for example, why it is desirable to single out mining and extraction as one of the 15 clusters when it accounts for less than half a percent of total employment. Moreover, as will be seen below, some states have elected to define a cluster called "agriculture and natural resources," which includes the NSSB sub-industries, as well as oil and gas extraction and other mining. From both an economic and a curriculum perspective, this seems to be a reasonable categorization.

Table 6
Distribution of Employment Among NSSB Industry Clusters

NSSB Industry Clusters	Number Employed	Percent Of Total
Wholesale/Retail Trade, Real Estate, & Personal Services	24,814,000	19.58
Manufacturing, Installation, & Repair	20,975,000	16.55
Health & Human Services	13,255,000	10.46
Education & Training	10,885,000	8.59
Restaurants, Lodging, Hospitality & Tourism, & Amusement & Recreation	7,943,000	6.32
Construction Operations	8,006,000	6.27
Business & Administrative Services	7,943,000	5.88
Telecommunications, Computers, Arts & Entertainment, & Information	7,451,000	5.73
Finance & Insurance	6,814,000	5.38
Transportation	5,923,000	4.67
Public Administration, Legal & Protective Services	4,918,000	3.88
Agriculture, Forestry, & Fishing	3,728,000	2.94
Scientific & Technical Services	2,021,000	1.60
Utilities & Environmental & Waste Management	1,746000	1.38
Mining & Extraction	569,000	0.45
Total	**126,310,000**	**99.69**

Source: bureau of Labor Statistics.

Similarly, it is not clear why NSSB chose to define a separate cluster called "scientific and technical services." This cluster includes scientific research and development services; architectural, engineering, and related services; administration of government housing, urban planning, and community development programs; space programs; and national security and international affairs. Most, if not all of these, might more reasonably be included in other clusters. The construction operations cluster, especially if it were redefined as building and environmental design, would be a good home for architectural services, as well as for some engineering. Engineering might also be assigned to manufacturing. There seems to be little justification for separating the administration of housing, urban planning, and community development from other public administration. Moreover, if the former is to be treated differently from other public administration, these functions are more closely related to construction than to scientific and technical services.

Likewise, placing national security and international affairs under scientific and technical services has no obvious rationale; they also could be part of public administration. There is probably stronger justification for placing space programs in this cluster, but these programs could just as easily be assigned to transportation, especially if these clusters are intended to reflect a contemporary to futuristic view of the economy. Finally, if the construction operations cluster were redefined to embrace the built environment and environmental design more comprehensively, this cluster might be a more suitable place for utilities and environmental waste management, which accounts for only 1.38 percent of total employment.

In short, with some redefinition, the NSSB framework could be reduced from 15 to 12 clusters, with little negative impact and perhaps even some improvement in the coherence of each cluster and the overall integrity of the framework. The NSSB taxonomy has already undergone one revision since the Board began its work, and it is possible that other revisions may follow. Hence, while the taxonomy represents the best and most comprehensive effort to date to establish a national framework of industry clusters, it may be premature to assume that this particular format will endure without any changes.

State Effort

Many states have undertaken their own initiatives to develop industry majors or career clusters for restructuring their work force preparation systems. Oregon was one of the first, establishing six career clusters to serve as areas of major concentration for the state's high school students (Table 7).

It is instructive to compare the Oregon framework with that of NSSB. At first blush, Oregon appears to have reduced the taxonomy to six clusters rather than the 15 posed by NSSB. While this small number might yield some administrative efficiencies, with respect to both program operation and curriculum development, such gains may come at a price. While we have urged conceiving of work broadly, there comes a point when generalization ceases to have clear meaning. For example, one of the interesting features of the NSSB framework is its explicit recognition of education and training as an industry, accounting for almost 10 percent of total employment in the United States. How ironic that in most discussions surrounding school-to-work or vocational education, the education industry is usually not considered as a source of significant employment. In the Oregon framework, education is subsumed under the human resources cluster, but this fact may be easily lost on the casual observer. Similarly, it is not immediately apparent where other key industries (for example, construction, transportation, hospitality and tourism, or even wholesale and retail trade) fit in the Oregon structure. It is, in some respects, too broad to maintain useful integrity and coherence in some of the major categories.

However, the value of a small number of clusters should not be summarily dismissed. Oregon intended that every high school student adopt a cluster in which to major. Therefore, it was important that all students have access to the full set of possible majors. As a practical matter, it is usually not possible for a single high school to offer more than six majors that include comprehensive academic and career preparation, and for very small high schools, even six is a challenge.

Table 7

Oregon's Career Clusters

Arts & Communications
Health Services
Industrial & Engineering Systems
Business Management
Human Resources
Natural Resource Systems

Still, there is nothing magical about the number six, and other states have elected frameworks with more clusters than the Oregon model but fewer than the NSSB framework.

Maryland, for example, has adopted nine clusters (Table 8). For the most part, the Maryland clusters communicate more clearly what they contain, but there are still vague labels and possible gaps. It is by no means clear what is contained in human resource services, nor is it apparent where either wholesale /retail trade or public administration is addressed in the Maryland framework.

Table 8

Maryland's Career Clusters

Consumer Service, Hospitality, & Tourism
Business Management & Finance
Manufacturing, Engineering, & Technology
Environmental, Agricultural, & Natural Resources
Health & Biosciences
Arts, Media, & Communications
Transportation Services
Human Resource Services
Construction & Development

As part of the research conducted for this paper, we surveyed each of the states regarding their efforts to develop industry or career clusters. Table 9 summarizes our findings. Of the 47 states from which we were able to obtain information, 38 had developed a new framework of industry or career clusters.

Of the 38 states with clusters, at least 35 had clusters in agriculture, business and administrative services, health and human services, manufacturing, and telecommunications. However, states did not necessarily adopt the same labels for a particular cluster (for example, one state might define a cluster as agriculture, another as agriculture and natural resources, and still another as agriculture and renewable resources). Moreover, the content of a cluster also varied.

Industry/Career Clusters by

NSSB Clusters	Agriculture, Forestry, & Fishing	Business & Administrative Services	Construction Operations	Education & Training	Finance & Insurance	Health & Human Services	Restaurants, Lodging, Hospitality & Tourism, & Amusement & Recreation	Manufacturing, Installation, & Repair	Mining & Extraction	Public Administration, Legal, & Protective Services	Transportation	Scientific & Technical Services	Telecommunications, Computers, Arts & Entertainment, & Information	Utilities & Environmental & Waste Management	Wholesale/Retail Trade, Real Estate, & Personal Services	Other
Alabama[1]	x	x	x			x		x					x	x		
Alaska																
Arizona	x	x				x		x					x		x	
Arkansas	x	x				x		x							x	x(1)
California	x	x	x	x		x	x	x		x	x		x	x	x	
Colorado	x	x			x	x		x					x		x	
Connecticut	x	x	x	x	x	x	x	x				x(2)	x		x	
Delaware	NO CLUSTERS															
Florida			x		x	x	x	x					x			
Georgia	NO CLUSTERS															x(3)
Hawaii	x	x				x		x					x			x(3)
Idaho	x	x				x		x								x(4)
Illinois	x	x				x		x								x(5)
Indiana	x	x	x	x	x	x	x	x		x	x	x	x		x	x(4)
Iowa	x	x				x		x					x		x	
Kansas	NO CLUSTERS															
Kentucky	x	x	x	x		x		x	x	x	x	x	x		x	
Louisiana																
Maine	x	x		x		x		x		x		x	x		x	x(6)
Maryland	x	x	x		x	x	x	x			x	x(2)	x			x(3)
Massachusetts[2]	x		x	x	x	x		x			x	x(2)	x	x	x	x(7)
Michigan	x	x	x	x(8)		x	x	x		x	x				x	x(9, 10, 11)
Minnesota[1]	NO CLUSTERS															
Mississippi	x	x				x		x					x		x	
Missouri	x	x				x		x					x			
Montana	NO CLUSTERS															
Nebraska	NO CLUSTERS															
Nevada	x	x	x			x		x	x				x			
New Hampshire	x	x				x		x					x			
New Jersey	x	x	x	x	x	x	x	x		x	x	x	x	x	x	
New Mexico	NO CLUSTERS															
New York	x	x				x		x					x			
North Carolina	x	x	x			x	x	x				x(2)	x		x	x(12)
North Dakota	x	x				x		x					x			
Ohio[1]	x	x				x		x							x	x(3)
Oklahoma	x	x	x	x		x		x			x	x	x		x	
Oregon	x	x				x		x					x			x(3)
Pennsylvania	x	x	x			x		x			x		x		x(13)	
Rhode Island[1]	NO CLUSTERS															
South Carolina	x	x				x		x					x		x	
South Dakota	x	x				x		x				x	x		x	
Tennessee[1]		x	x			x	x	x			x	x	x		x	
Texas	x	x		x(14)		x		x		x			x		x	
Utah	x	x	x	x		x		x		x	x	x	x		x	
Vermont	x	x				x		x					x		x	
Virginia	NO CLUSTERS															
Washington		x				x		x				x	x		x	
West Virginia	x	x				x		x				x	x		x	
Wisconsin	x	x		x		x		x		x		x	x	x	x	
Wyoming	NO CLUSTERS															
TOTAL	35	38	16	12	7	38	9	38	2	9	11	15	35	5	26	

(1) Trade & Industrial Education
(2) Biosciences/Biotechnology
(3) Human Resources
(4) Human & Family Services
(5) Mechanical Repair & Precision Crafts
(6) Sports & Physical Performances
(7) Human Commerce
(8) Child & Adult Care
(9) Visual Imaging Technology
(10) Electro Mechanical
(11) Drafting/Design
(12) Electronics
(13) Consumer Services
(14) Human Development, Management, & Services

[1] Clusters are either under development or not yet adopted.
[2] Clusters were developed for the School-to-Work Office. Development for vocational education is scheduled for summer 1998

State

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There was a retail/ wholesale cluster in 26 of the 38 states with clusters, and 16 states had a construction cluster[8]. No other single cluster was present in more than 15 states. Mining existed as a separate cluster only in Kentucky and Nevada.

The School-to-Work Opportunities Act appears to have been a major influence on states' decisions to develop clusters. All of the states receiving School-to-Work implementation grants in the first two years had a system of clusters in place. Some of the states were using these frameworks only in implementing school-to-work initiatives and had not yet applied the clusters to restructuring vocational education offerings.

In summary, using clustering as a framework for organizing work force preparation, including the restructuring of vocational education offerings, appears to be taking hold in the vast majority of states. However, states have approached clustering in many different ways. Only five clusters are common to almost all states. Three of these-agriculture, business, and health-are the same general program areas that are part of the traditional vocational education program structure, but two-manufacturing and telecommunications-are not. All five are represented in the taxonomy proposed by the National Board for Professional Teaching Standards.

Conclusion and Recommendations

Designing a useful framework for describing and organizing the delivery of work force preparation in the United States is a difficult task. Many important issues are at stake, beginning with the fundamental aims of professional, vocational, or technical education. The structure will have important implications for curriculum, instruction, and teacher education. It will communicate an image, which sends powerful messages to students, parents, and the general public about the system's expectations of students who elect to participate in it and the opportunities afforded them through successful program completion.

Efforts that move toward a new structure of program offerings in vocational education should, therefore, proceed with caution. At this point in the evolution of national and state approaches, there are at least seven major industry clusters that are common to the national initiatives and most state efforts. These include the following:

[8] *Because the building trades have figured so prominently in vocational education offerings, it is surprising that only 16 states have so far defined construction as a distinct cluster. Why this is so and where states without a construction cluster locate the building trades in their frameworks may warrant some further investigation.*

- Agriculture & Natural Resources
- Business Services & Finance
- Communications & Information Technology
- Construction & Environmental Design
- Health & Human Services
- Manufacturing, Installation, & Repair
- Wholesale, Retail, & Personal Services

In addition, hospitality and tourism is a major focus in some states, as well as national associations. Finally, almost all the states provide some form of family and consumer science programs, and many offer technology education.

Could these eight industry clusters, along with family and consumer sciences and technology education, provide a new framework for organizing career and technical education in the United States? It is too soon to say. Certainly, the specific programmatic content of each of these clusters would differ among states, and perhaps even among localities within states. Moreover, some states might want to add another industry or cast one of the eight in different terms. The point of a new framework should not be achieving strict uniformity throughout the country. Rather, it should serve as a flexible structure for communicating the overall mission and scope of career and technical education in the United States and also provide guidance for curriculum development and improving instructional practices.

Whatever new framework finally emerges, it is important that it satisfy three essential Criteria:

1) It should address the long-term employment prospects of students, emphasizing the knowledge and skill needed for a successful lifetime of work, not merely the requirements of entry-level jobs.
2) It should encourage high levels of academic proficiency and mastery of sophisticated work-based knowledge and skill, contributing to the national agenda for improving education at all levels.
3) It should preserve the full range of postsecondary options for program participants, eliminating any presumption that participating in work-related curricula at the elementary and secondary levels signals a lack of interest or an inability to pursue further education in four-year colleges and universities.

A new framework that meets these criteria will build on the strong traditions of vocational education in the United States, while at the same time positioning the enterprise for making greater contributions to education and work force preparation in the 21st century.